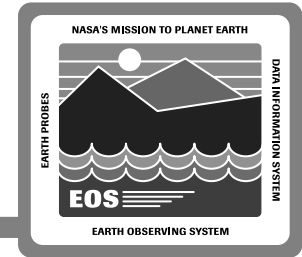


Communications Subsystem (CSS)

Naveen Hota

16 October 1995

Roadmap



Communications Subsystem (CSS) Introduction

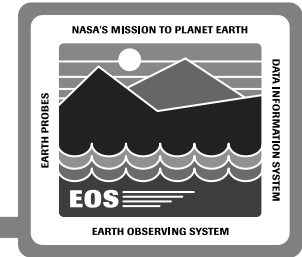
- Context
- Definitions
- CSS Services

Cell Topology / Deployment

CSS Services

- Message Passing
- Multicasting
- Directory / Naming
- Time
- Security
- FTP
- E-Mail
- Event Logging

Context



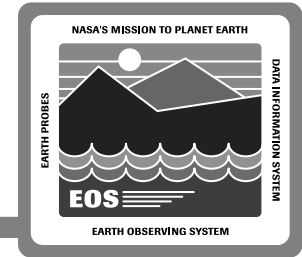
Objective

- **Provide FOS the infrastructure to develop communications applications**
- **Provide FOS the Application Programming Interfaces (APIs) to core services**
- **Isolate FOS applications from technology changes to minimize breakage**
- **Not CSS Design Review**
 - **CSS Design Review was conducted on 8/15/95**
 - **Applicability of CSS services to FOS**

Users

- **FOS applications programmers**

Definitions



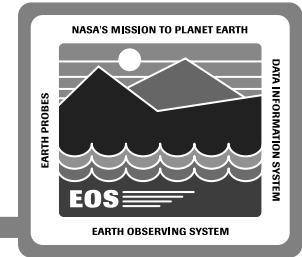
OSF DCE

Today's state-of-the-art solution for industrial-strength, vendor-independent, distributed enterprise computing. It is a widely available multi-vendor client/server communications environment integrated with security, administrative support and directory services.

HP OODCE

Object Oriented development environment to DCE. Provides a C++ class library interface to DCE services. OODCE encapsulates many of the complex DCE syntax and commands into powerful, easy-to-use objects.

CSS Services



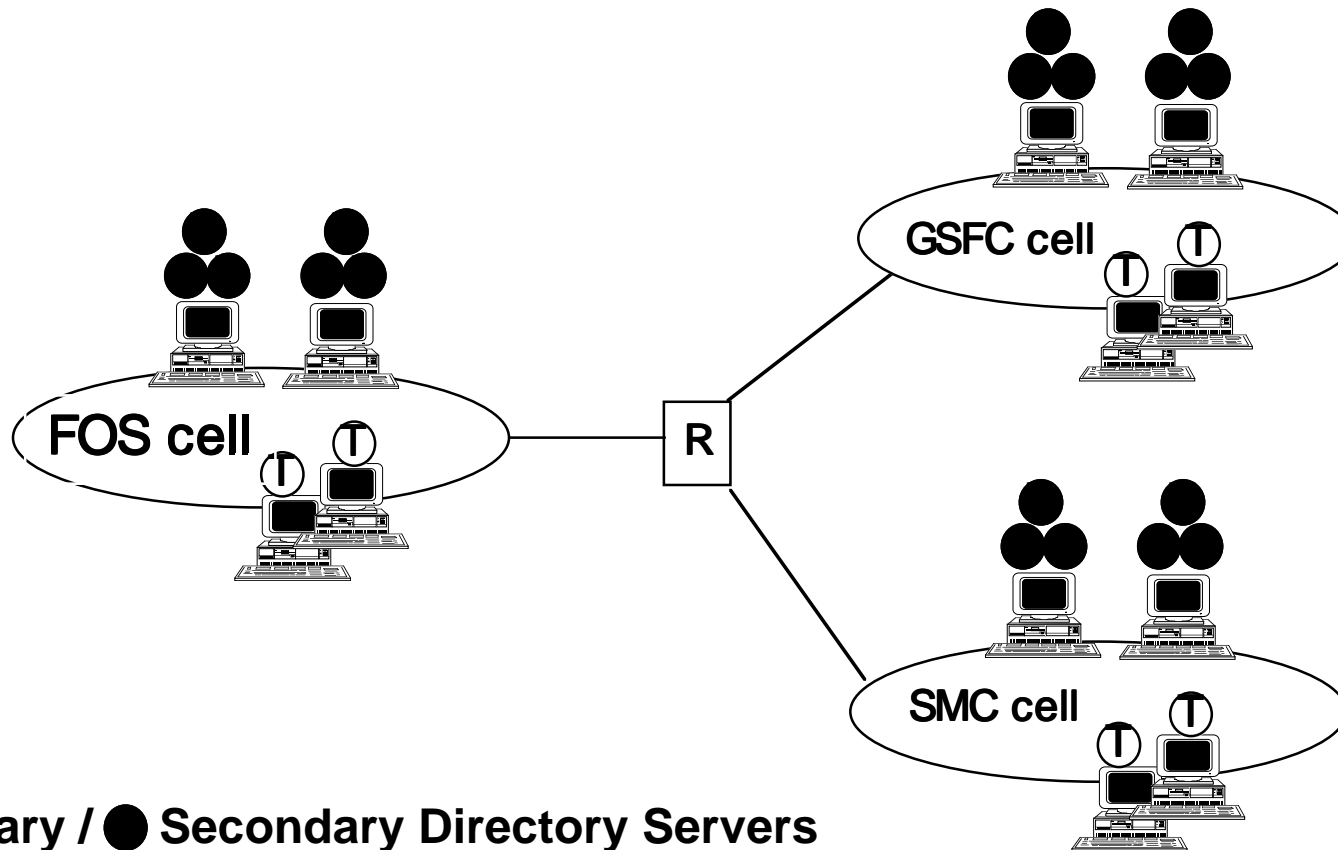
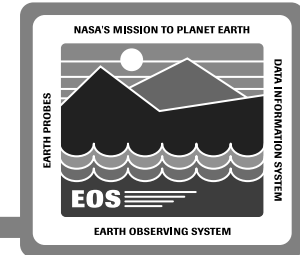
Object Services

- **Provide Enterprise-Wide, Transparent, Heterogeneous, Interoperable core services for Distributed Computing**
 - Security, Directory, Time, Message Passing
- **FOS applications interact with them**

Common Services

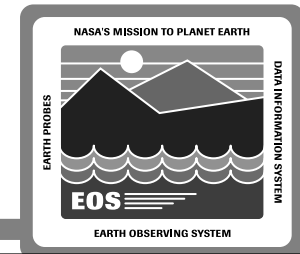
- **High level uniform semantics that are shared across applications**
 - File Access, Bulletin Board, FOS Internal E-Mail, Event Logger

Cell Topology / Deployment



- Primary / ● Secondary Directory Servers
- Primary / ● Secondary Security Servers
- Time Server ⊕ Time Clerk

Cell Topology / Deployment (cont.)



Real-Time Server

Security
Directory
Time Srv
Bulletin Board
E-Mail
Multicast
Message Passing
KFTP

Data Server

Security
Directory
Time
Bulletin Board
E-Mail
Multicast
Message Passing
KFTP

LSM CSS

Security Srv
Directory Srv
Time Srv
Bulletin Board Srv
E-Mail Srv
Multicast
Message Passing
KFTP

LSM CSS W/ S

Multicast
Reflector

User Station

Security
Directory
Time
Bulletin Board
E-Mail
Multicast
Message Passing
KFTP

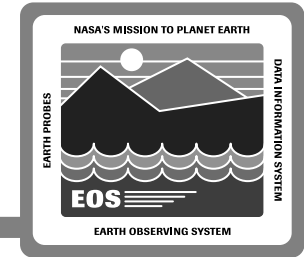
IST

Security
Directory
Time
Bulletin Board
E-Mail
Message Passing
KFTP

LSM MSS

Security Srv
Directory Srv
Time Srv
Bulletin Board
E-Mail
Multicast
Message Passing
KFTP

Message Passing (point to point)



Why

- To exchange data between FOS application processes

Functionality

- Control returns to the caller immediately
- Provides store and forward mechanism
- Guaranteed message delivery with callbacks
- Provides multiple priority levels
- Multiple number of retries with intervals (specified)

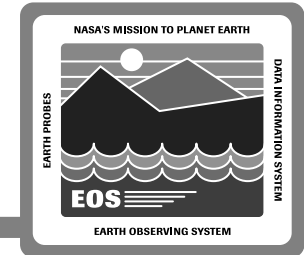
Users

- FOS application programmers

FOS Context

- FOS basic interprocess communications
 - Send analysis requests
 - Send command authority change requests
- Notifications (Management Applications)

Message Passing (cont.)

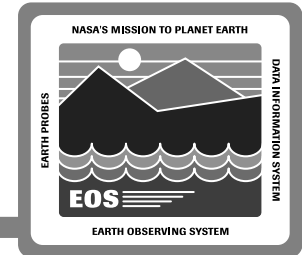


Provide a common point to point Messaging API (documented in SCDO DID 305 Vol 11)

- HCL as Interim underlying transport for A1
- Migrate to OODCE transport
- Availability of features

Name	A 1 (interim)	Final
Available to Programmers	11/15/95	5/1/96
Transport	HCL	OODCE
Send	x	x
SendWait	x	x
Receive		x
ReceiveWait		x
Priorities		x
Store&Forward		x
Multiple retries		x
Intervals between retries		x
Security		x
Support Callbacks	x	x
Logical Names	x	x

Multicasting



Why

- To provide asynchronous communications between one to many FOS applications simultaneously

Functionality

- Control returns to the caller immediately
- High performance and saves network bandwidth
- Uses UDP transport
- Join and leave groups without disrupting group communications
- Unicast can be supported through reflectors

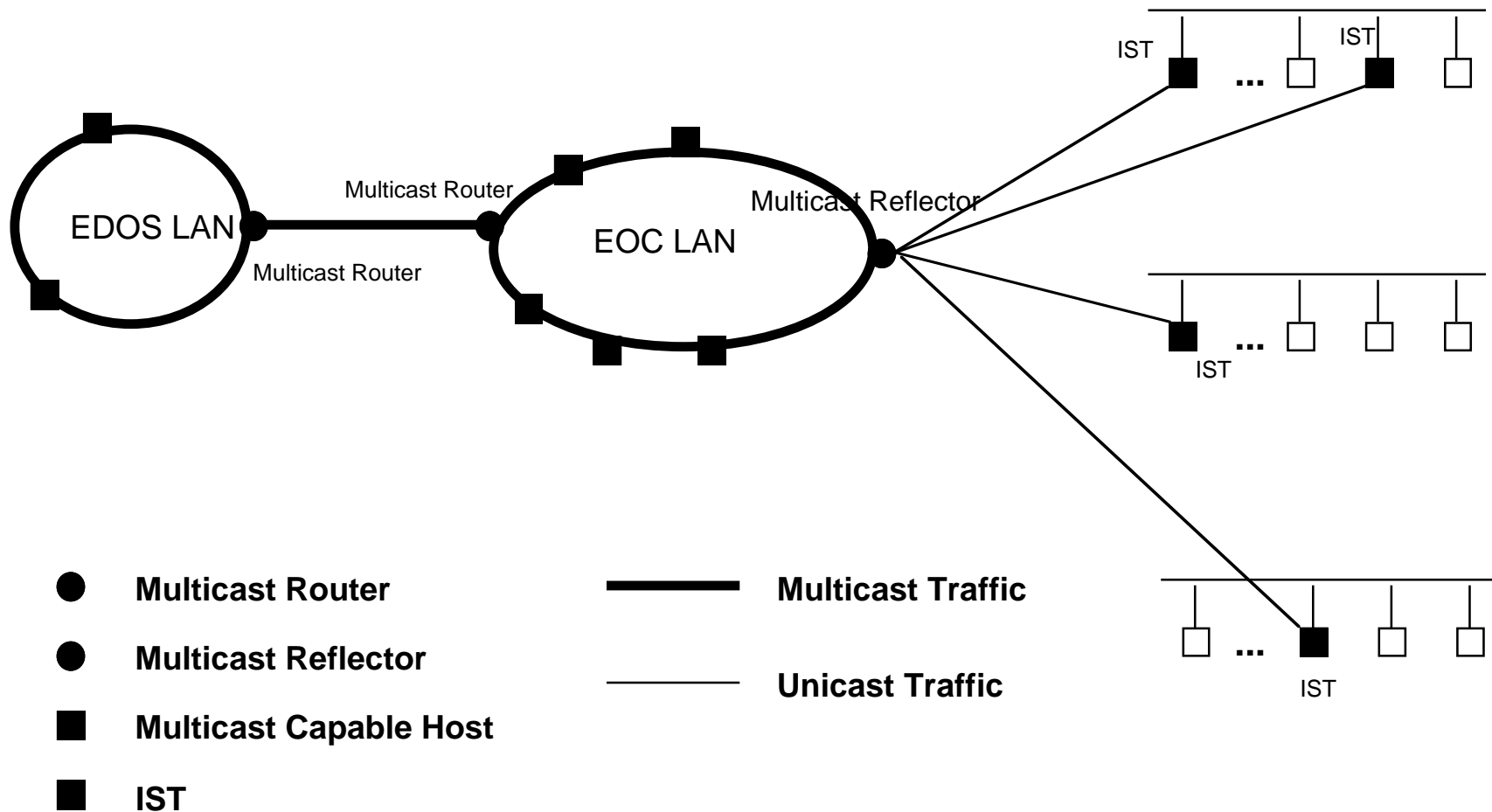
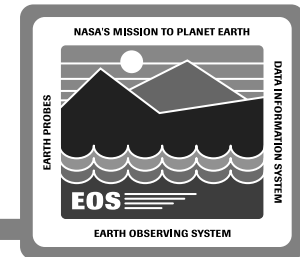
Users

- FOS application programmers

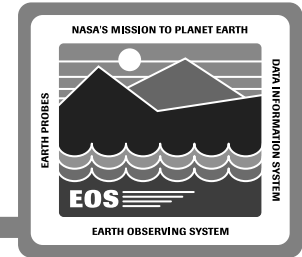
FOS Context

- Forwarding real time telemetry data from EDOS to FOS hosts
- Shared telemetry replay
- Send event notifications
- Transfer of telemetry to ISTs (via multicast reflector)

Multicasting Infrastructure



Directory/Naming



Why

- Dynamically locate logical network resources

Functionality

- Provides location transparency
- Allows server applications to store binding information so client applications can find servers
- Stores and retrieves application related information in distributed environment for other applications to share
- Directory information is replicated and distributed across platforms

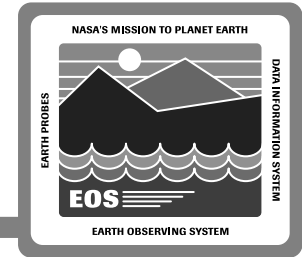
Users

- Internal, FOS application programmers

FOS Context

- Stores FOS server application binding information
- Asynchronous message passing (logical queue names)
- Multicasting (group names)

Time Service



Why

- To maintain uniform time across FOS hosts

Functionality

- Takes external time (NASA-36) and synchronizes host (EOC and IST) clocks

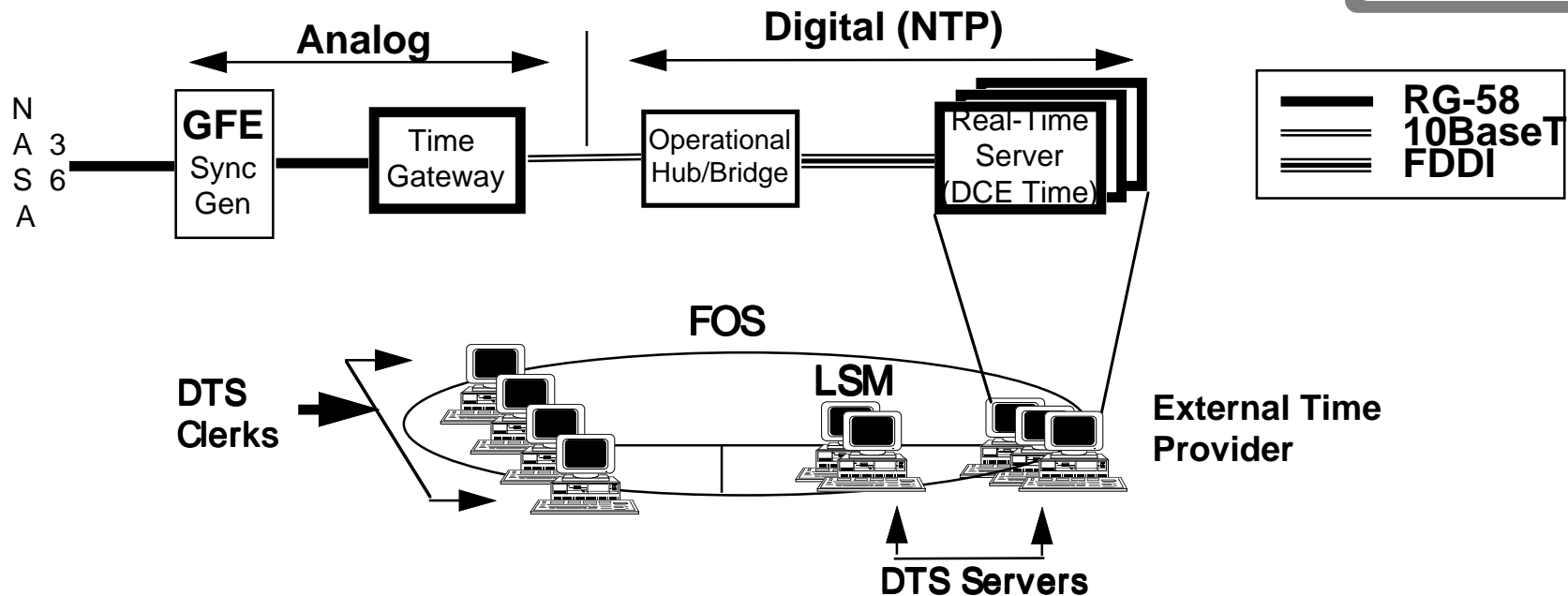
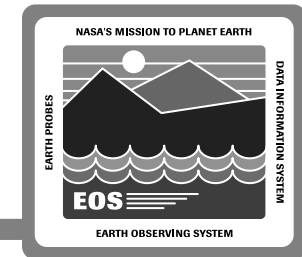
Users

- Internal, application programmers

FOS Context

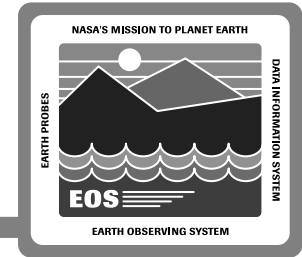
- Host clocks must be synchronized (tunable) with reasonable accuracy for event sequencing, duration and scheduling
- Distributed event logging

DTS Configuration Plan



- External time is fed at FOS cell into Real-Time Servers (Global Server)
- Each LAN will have at least 3 Time Servers (Couriers)
- Each FOS user station and IST will have a time clerk

Security



Why

- To protect the integrity of FOS data and services (resources)

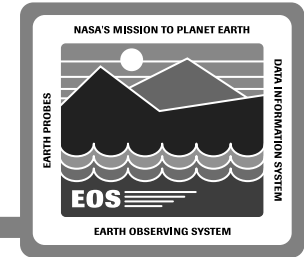
Functionality

- Creates, maintains and verifies user/server identities
 - Server keytab files (passive principals)
- Creates, maintains and checks privileges for service access
 - Create and maintain Access Control Lists (ACL)
 - Provides persistence
- Protects data in transit
- Provides Security to non DCE applications through GSSAPI

Users

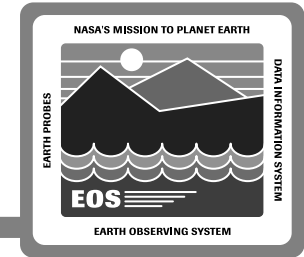
- Internal, FOS application programmers

FOS Security Architecture



Security Service	Implementation
Authentication <ul style="list-style-type: none">• Passwords do not appear on net	DCE-based Kerberos encryption
Authorization and Access Control <ul style="list-style-type: none">• Integrated with Authentication• Network Layer• Application layer	DCE Access Control Lists (ACLs) and Router Firewalls at EOC
Data Integrity <ul style="list-style-type: none">• Encrypted checksums (prevents intentional tampering and unintentional corruption during transit)	COTS encryption software, KFTP

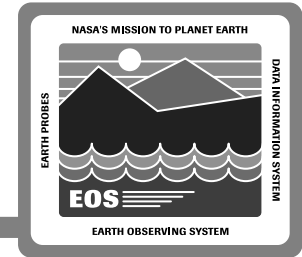
Security (cont.)



FOS Context

- **Authenticates FOS users and Servers**
 - Verify the identity of user/service when logging in
- **Authorizes user/client access to services/resources**
 - Determine if user is authorized for command authority or ground control Privileges
 - Determine if specific HW (User Stations) can be used for command authority or ground control (FOT may want to prevent command capability from US in offices outside of the EOC)

FTP



Why

- To transfer data electronically within FOS and to external entities

Functionality

- Transfers files interactively
- Transfers files programmatically (API)
- Provides authenticated access [via kerberized FTP (kFTP)]
- Provides Notification capability when a file transfer is complete

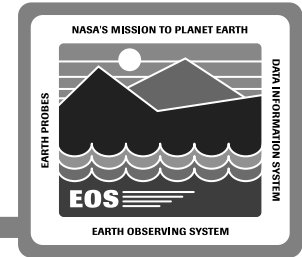
Users

- Data Mover (IST, User Station)

FOS Context

- Transfer Instrument Reports
- Transfer Display page definitions
- kFTP files from ISTs to EOC
- Notifying DMS when FDF sends data files to EOC

Electronic Mail



Why

- Operators/applications to communicate with users

Functionality

- Operators will have software to interactively read and send messages
- The application developers will have an API which they can use to send messages

Users

- Operators, application programmers, end users

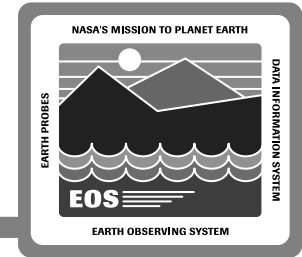
FOS Context

- Operators use E-Mail to interact with FOS users
- Mail to and from FOS hosts

Note:

- SCFs can still have non-FOS E-Mail

Event Logging



Why

- To generate a permanent log of FOS management events

Functionality

- CSS provides a set of objects to allow developers to log management messages
 - to management logs with criteria to trigger SNMP traps
- Works in conjunction with MSS services

Users

- MSS applications

FOS Context

- MSS applications to log management events for historical data